

Armed Forces College of Medicine AFCM



Diaphi jm and phrenic nerve

Professor Dr: Shahira Youssef

INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

- 1-Describe the origin and insertion of diaphragm
- 2-list the openings in diaphragm, level, structures passing through each open and their clinical significance
- 3-Discuss the relations, nerve supply, blood supply and action of diaphragm

Lecture Plan



- 1. Part 1 (5 min): Introduction to diaphragm
- 2. Part 2 (35 min): origin, insertion, openings, nerve supply, blood supply relations and action
- 3. Part 3 (5 min): Summary
- 4. Lecture Quiz : (5 min)

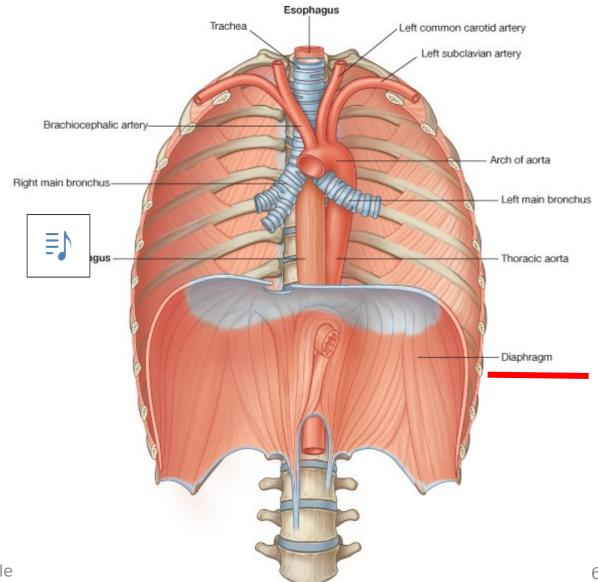
Key points



- 1. Origin of diaphragm sternal, vertebral and costal
- 2. Nerve supply and its root value
- 3. Openings; level, site and structures passing



- > A thin muscular & tendinous partition between the thorax & abdomen
- Dome shaped , superior surface is convex & inferior surface is concave
- Lateral regions are called cupola
- Right cupola is 9/1h/igher



Origin of diaphragm



Origin:

1-

Sternal

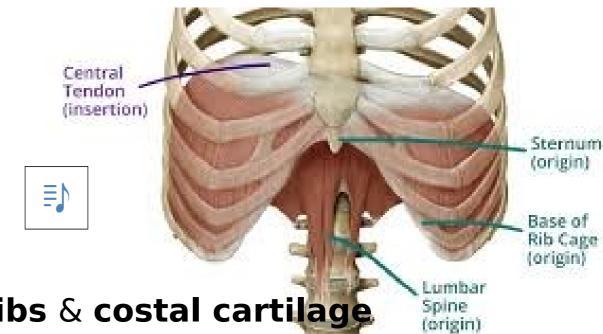
2-Costal

3-

Vertebr

nal alback of xiphoid process

f tal : inner surface of lower six ribs & costal cartilage



The Diaphragm — Origin & Insertion

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Zp4LkAhWJ34UKHQNlA8kQMwhkKAQwBA..i&w=800&h=552&bih=689&biw=1280&q=origin%20and%20insertion %20of%20diaphragm&ved=0ahUKEwjZwt-Zp4LkAhWJ34UKHQNlA8kQMwhkKAQwBA&iact=mrc&uact=87 Cardiopulmonary module

Origin of diaphragm



3-Vertebral =Two crura & ligamen

<u>Right crus</u> :

From bodies of upper **3** lumbar Vertebrae.

Larger, Longer

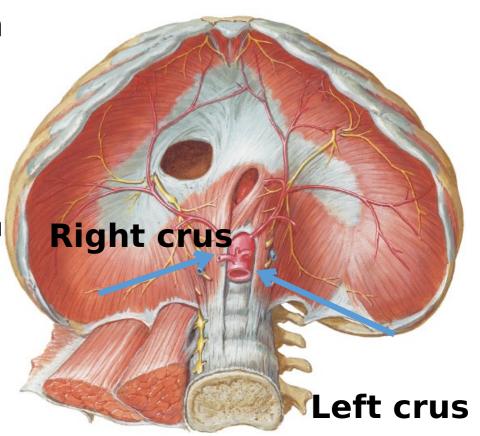
🕆 Fibers run up & surround esophagus 📑

Some pass down & form suspensory ligamo

f duodenum

Left crus

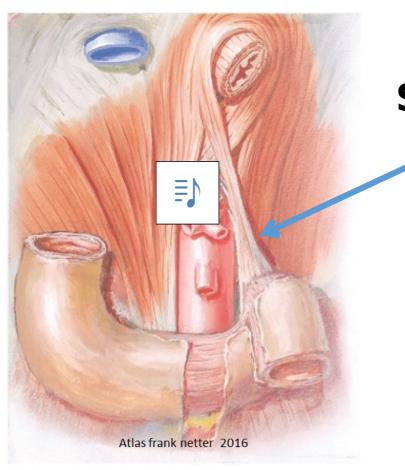
from upper 2 lumbar vertebrae.



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Origin of diaphragm





Suspensory ligament

Origin of Diaphragm



edian arcuate ligament: lies across aorta

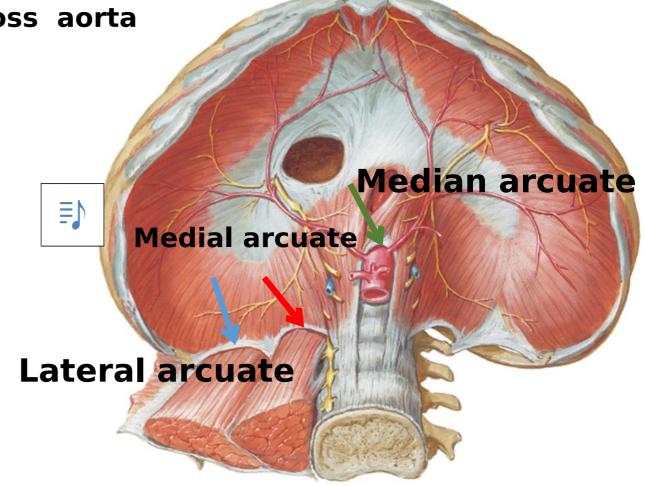
een 2 crura

<u>ledial arcuate ligament</u>

e over psoas ktend from side of body of it or second lumbar to front of nsverse process of first lumbar

ateral arcuate

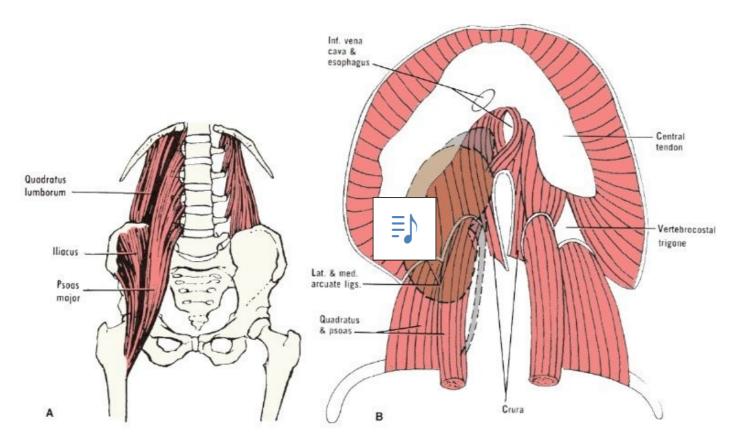
e over quadratus lumborum tends from front of transverse ess of first lumbar to lower er of 12 rib ese fibers are missing ebrocostal agle occurs & kidney will be in contact pleura_(/11/24)



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Origin of Diaphragm





http://www.liberaldictionary.com/wp-content/uploads/2018/11/vertebrocostal-trigone.jpg



Diaphragm

Right crus ()

-forms esophageal hiatus

Left crus

Median arcuate ligament ———

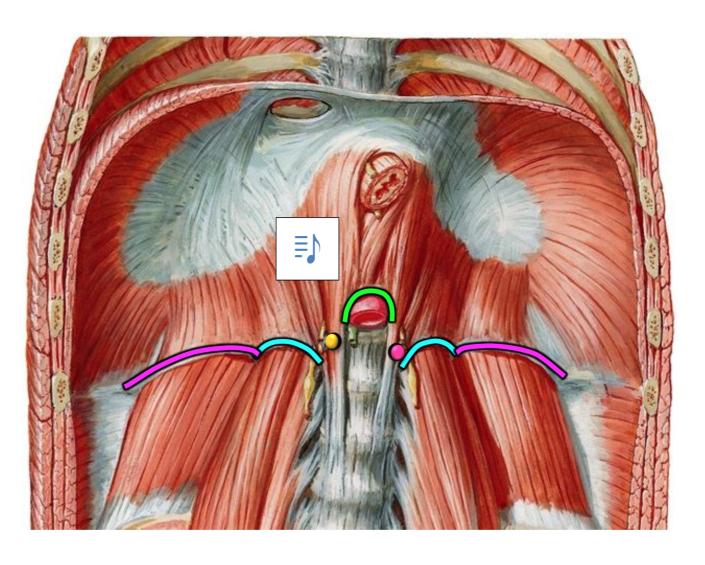
-anterior border of the aortic hiatus

Medial arcuate ligament

-crosses psoas major

Lateral arcuate ligament ———

-crosses quadratus lumborum



Insertion of Diaphragm



<u>tion</u>:

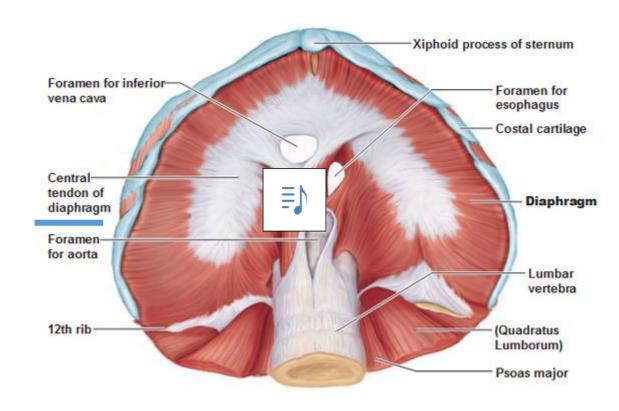
rs converge into central tendon shaped like e leaves



Central tendon

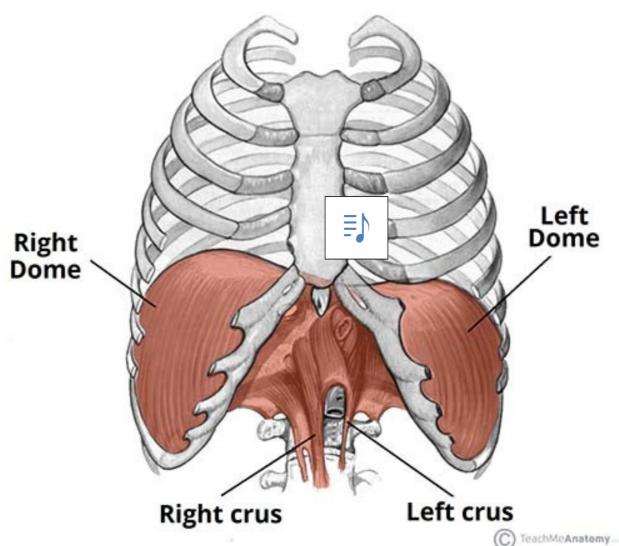






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%2Fsocratic.org%2Fquestions%2Fis-the-diaphragm-a-smooth-muscle-or-a-skeletalmuscle&psig=AOvVaw2PqQKIGm26pnpQ3AdsbrIK&ust=1565869493429570







Questions

- 1- Compare the right and left crus of the diaphragm
- 2-lateral arcuate ligament extends from...... To
- 3-Medial arcuate ligament extends fromto
- 4- Which ribs give origin to diaphragm

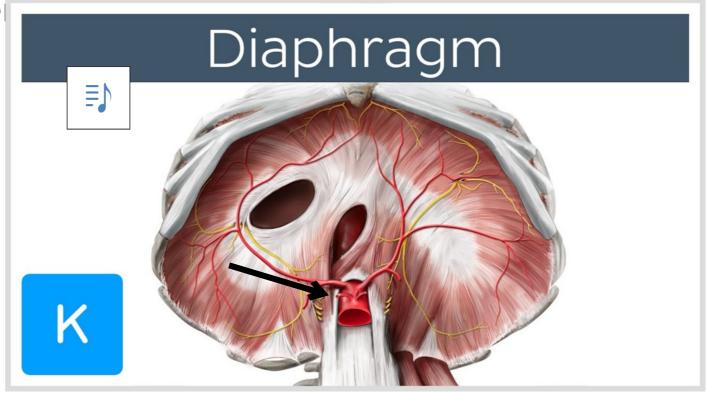
Aortic opening of diaphragm



Aortic opening

- ➤ Lie at lower border of T 12
- Behind median arcuate ligame
- > Transmit
- 1- Aorta
- 2- Thoracic duct
- 3- Azygous vein

(ATA ???)



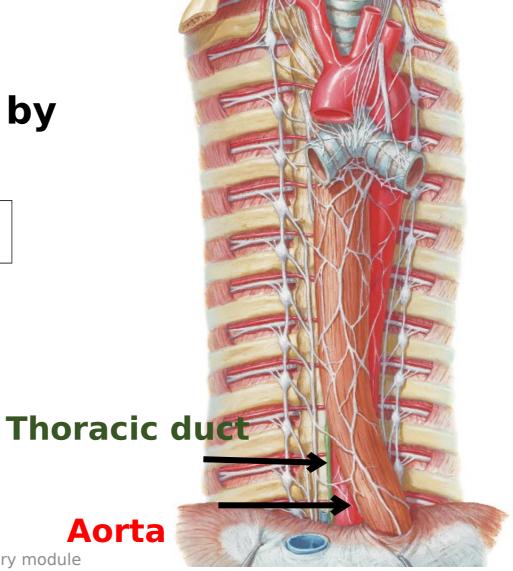
Aortic opening



Blood stream is not affected by **Contractions of diaphragm**



Cardiopulmonary module



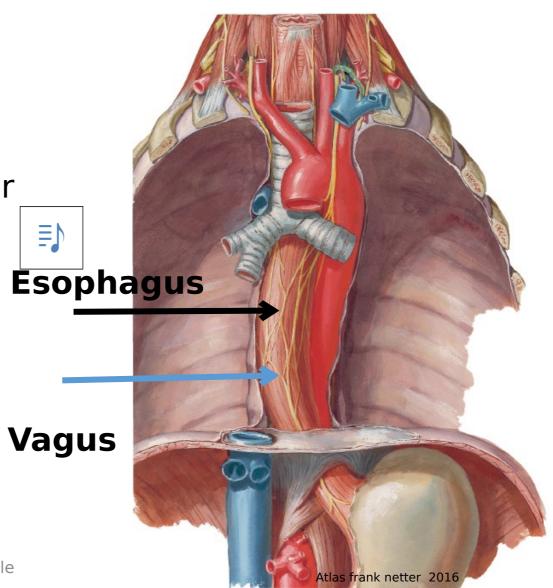
Aorta

Esophageal opening of diaphragm

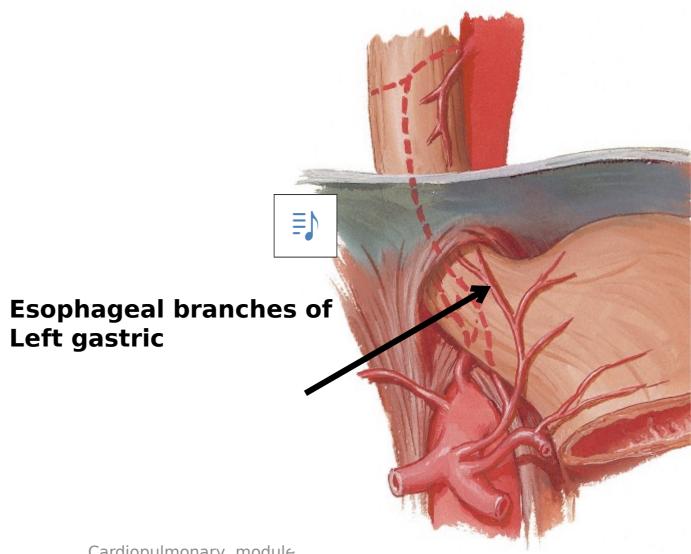


Esophageal opening:

- ➤ Lies at level T10
- One inch to left of median plane
- In a sling of right crus, In muscular part (sphincter)
- > Transmits
- 1- Esophagus
- 2- Vagus
- 3- Branches from left gastric







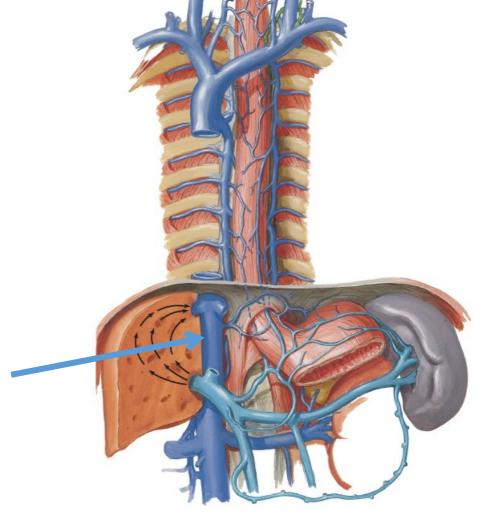
IVC Opening of Diaphragm



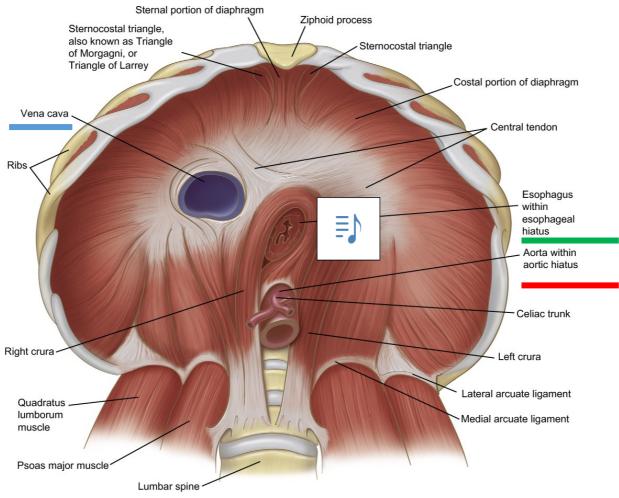
Vena Caval opening

- Lie opposite t 8
- One inch to right of median plane
- > In central tendon
- > Transmit
- 1- IVC
- 2- Right phrenic
- 3- Lymph from liver









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Minor foramina of Diaphragm



Arteries

- □Superior
 epigastric:
 between sternal &
 costal origin

Nerves

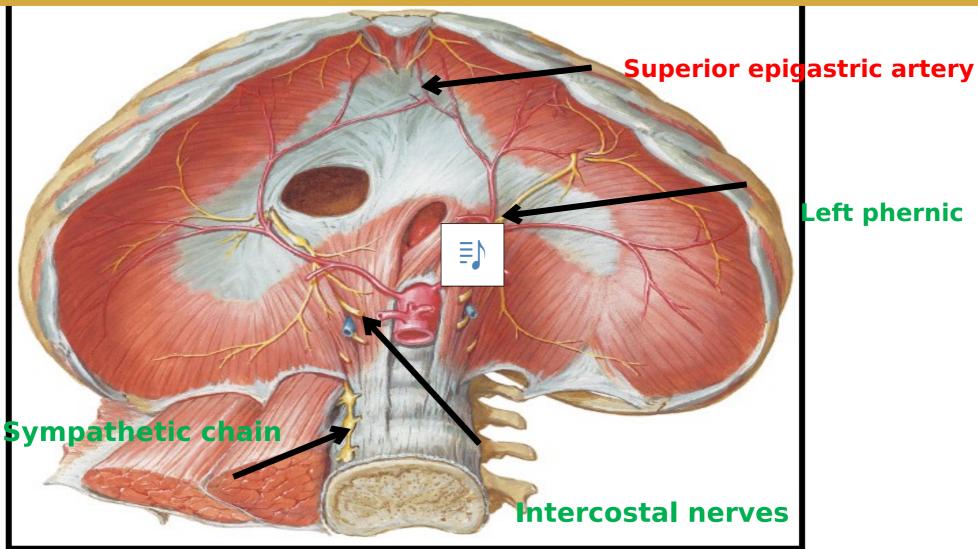
Lower five intercostals: between slips from lower 6 costal cartilage



- □Subcostal nerve & vessel : behind lateral arcuate
- **Sympathetic chain**: behind medial arcuate
- Left phernic: lateral to left part of central tendon

Minor foramina of Diaphragm





Questions



Questions

- 1- Mention level of aortic ,esophageal and IVC opening
- 2- What structures pass in IVC opening
- 3- sympathetic chain passes behind.....
- 4- Thoracic duct passes in

Relations of Diaphragm



Superior:

→Pleura & lungs

→Pericardium & heart

Inferior:

On the right side:

right lobe of liver,

➢ right kidney & right suprarenal



On left side:

▶left lobe of liver

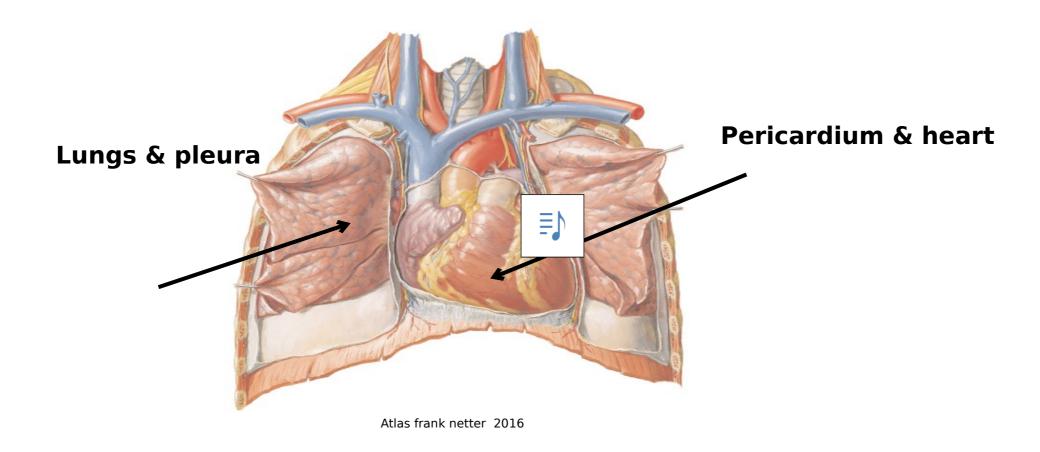
> stomach

>spleen

▶left kidney & left suprarenal

Relations of Diaphragm

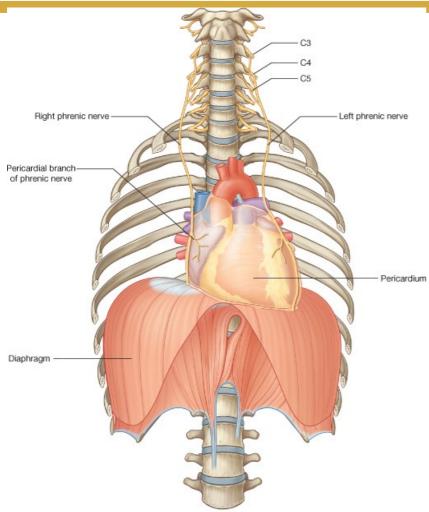




Relations of Diaphragm



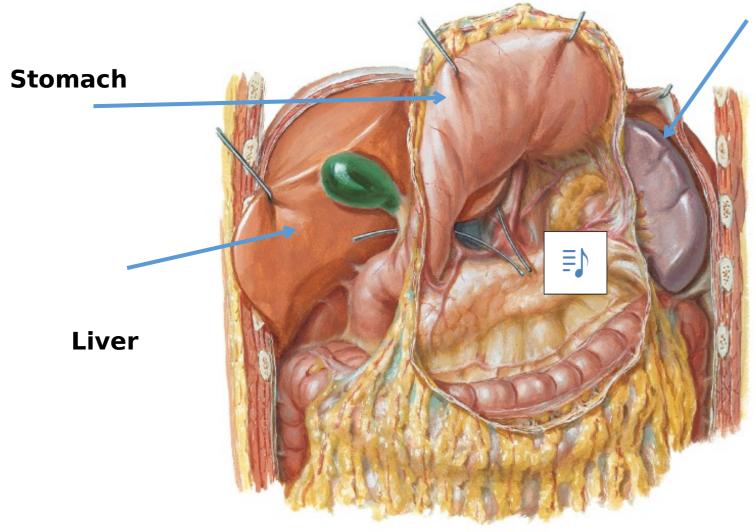
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Spleen

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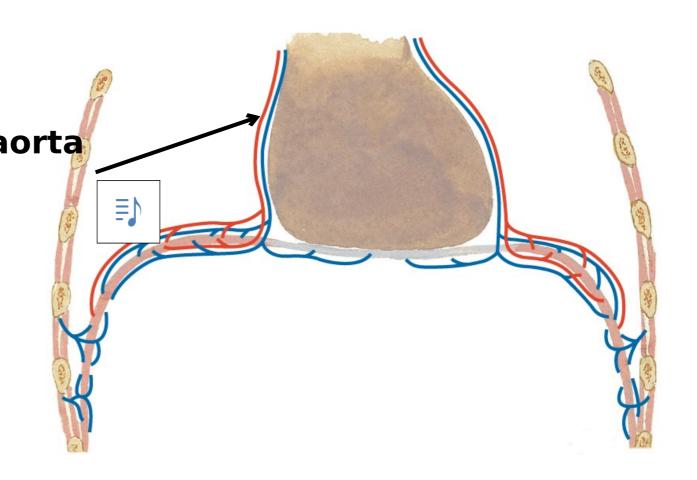
Blood supply of diaphragm



ood supply:

ericardiophrenic nferior phrenic a branch of aorta

Musculo-phrenic

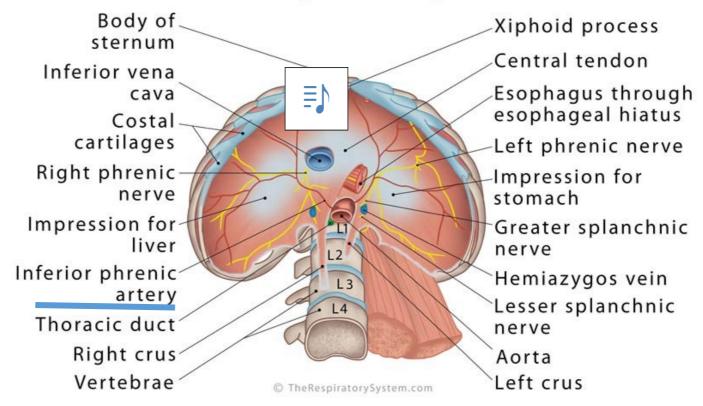


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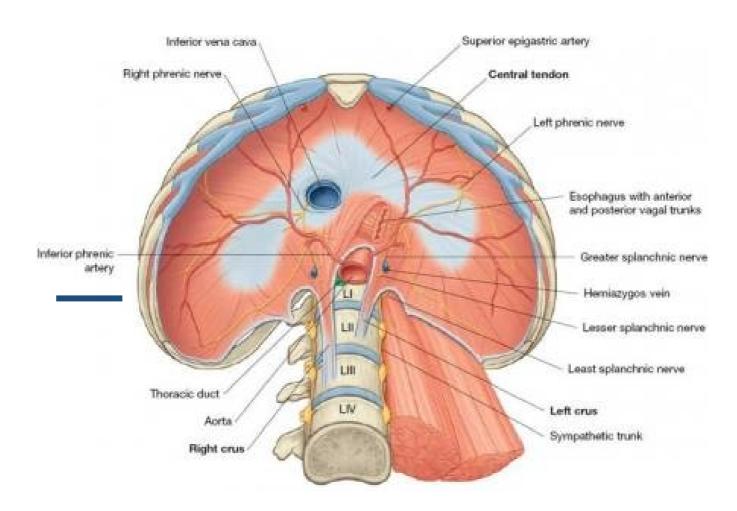
Blood supply of diaphragm



Diaphragm







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%2Bdiaphragm&psig=AOvVaw1g8wdBxJ5wtDKuVSCtw6fh&ust=1565870791509036

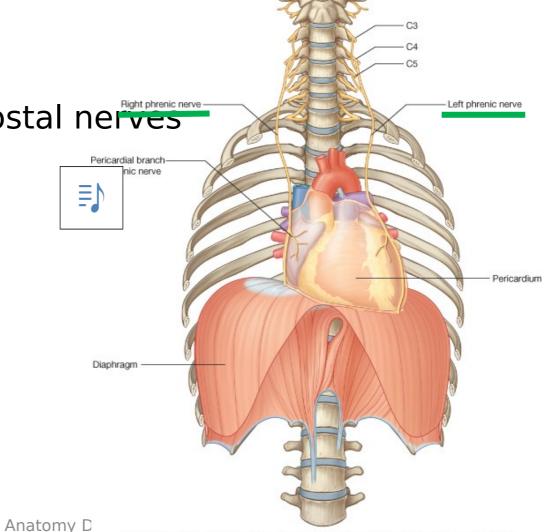
Nerve supply of diaphragm



lerve supply:

Motor: phrenic nerve C3, 4, 5

Sensory: phrenic & lower intercostal nerves

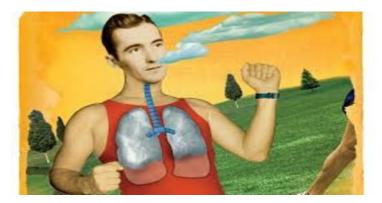


Action of diaphragm



Action:

- Muscle of respiration
- Expulsive action like coughing, miting & sneezing
 Forms a sphincter around esop jus from



Phrenic nerve



ch of cervical plexus C3, 4, 5

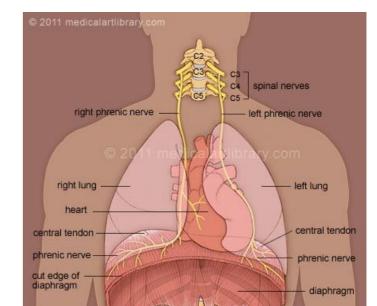
e right side:

escends medial to right brachiocephalic vein , SVC and pericardium of right atr es anterior to the hilum of the lung

e left side

escends between left common carotid abclavian superficial to left vagus asses superficial to arch of aorta

es anterior to the hilum



Phrenic nerve



Questions

1- What is the root value of phrenic nerve

2- Phernic nerve supplies

Phrenic nerve



Anatomy of the Thorax



http://www.medicalexhibits.com/obrasky/2009/09061_05X.jpg

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Lecture Quiz



Question 1 which of the following passes in aortic opening of diaphragm

- a) Left gastric
- b) Vagus nerve
- c) Thoracic duct
- d) left phrenic
- e) Sympathetic chain



Question 2

Enumerate nerve and blood supply of diaphragm

SUGGESTED TEXTBOOKS



1. Anatomy by regions Richard Snell 9th edition







